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Does lavender oil improve sleep quality in adults ages 18 to 65 years old?

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A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

In Partial Fulfillment of the Requirements For

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In

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Department of Physician Assistant Studies
Philadelphia College of Osteopathic Medicine
Philadelphia, Pennsylvania

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ABSTRACT

OBJECTIVE: The objective of this selective EBM review is to determine whether or not lavender oil is an effective therapy in improving the overall sleep quality in patients ages 18 to 65 years old.

STUDY DESIGN: Systematic review of one double-blind two-stage randomized control trial (RCT), one double-blind RCT, and one single-blind RCT.

DATA SOURCES: All articles were published in English and were taken from peer reviewed sources using CINAHL Plus and Alt HealthWatch. All articles used were published between 2010-2015.

OUTCOMES MEASURED: Two of the article's outcomes were based on the patient self-reporting improved sleep quality using the Pittsburgh Sleep Quality Index (PSQI). The third article outcome was measured by the patient self-reporting improved sleep quality, but this study used the Oguri-Shirakawa-Azumi Sleep Inventory MA version (OSA-MA). The results of all articles were compared to the patient's baseline responses prior to the beginning of the study.

RESULTS: All articles demonstrated that lavender oil, whether inhaled or ingested, did statistically improve overall sleep quality.

CONCLUSIONS: Based on the results of these three studies, it appears that there is acute improvement in sleep quality for patients who used lavender oil therapy. Further research is warranted to determine if long-term use of lavender oil has serious side-effects and whether it is as satisfactory in improving sleep quality as compared to prescribed and over-the-counter medications.

KEYWORDS: insomnia, lavender oil, aromatherapy

INTRODUCTION

There are roughly 80 different types of sleep disorders and it is estimated that there are 70 million Americans who suffer from these various sleep disorders.¹ The CDC recommends that adults over age 18 should get at least seven hours of sleep a night, but 35% of adults report less than that.² Lack of sleep leads to the average US worker missing 11.3 days of work which is equal to \$2,280 lost in productivity every year.³ As a nation, that is 252.7 days of missed work, as well as \$63.2 billion dollars lost.³ Not only does lack of sleep correlate to lower overall earnings, but it also increases the risk of health issues.

Inadequate sleep has been correlated to increased incidence of anxiety, depression, obesity, hypertension, coronary heart disease, stroke, poor mental health and even early death.² With increased health issues, comes increased health care visits. In 2010, over 8 million health care visits were due to sleep disturbances, which is a 29% increase from 1999.⁴ Healthcare providers encourage patients to try cognitive and behavioral treatments like relaxation techniques (yoga, massages, mediation), stimulus control and regular sleep schedule habits.⁵ When those strategies fail, providers resort to medications to help aid in sleep. There are prescription and over-the-counter medications currently on the market including melatonin receptor agonists, benzodiazepines, antihistamines, hypnotics, orexin receptor antagonists and tricyclic-antidepressants. These medications have been shown to enhance sleep, but they come with dependence potential and other serious side-effects. Side-effects include: idiosyncratic hyperactivity, central nervous systemic depression leading to increased risk of falls, disorientation, aggression, amnesia, nightmares, sleep walking, headache, dizziness, and nausea.

Throughout the years, lavender oil has been added to the treatment regimen in a variety of conditions, but little research has been completed to prove the efficacy of its use. Recently,

there has been suspicion that lavender oil may aid in improving sleep quality for patients who suffer from sleep disorders while causing little to no side-effects. This is due to the suggested sedative and relaxant properties that lavender is thought to possess. For this reason, lavender oil is growing in popularity as an alternative sleep aid therapy. In order to provide more clarity to this theory, this systematic review analyzed the effects of lavender oil on overall sleep quality.

OBJECTIVE

The objective of this selective EBM review is to determine whether or not lavender oil is an effective therapy in improving the overall sleep quality in patients ages 18 to 65 years old.

METHODS

This systematic review will examine the effects of lavender oil on sleep quality. Any article selected was a RCT, included adults ages 18 to 65, and used lavender oil in the study. Articles were excluded if they were published earlier than 2007 or involved participants younger than 18 or older than 65. The intervention being reviewed was the use of lavender oil, either inhaled or ingested, compared to a visually matched placebo. Outcomes measured were patient oriented and focused on participant's post-intervention sleep quality compared to participant's baseline sleep quality using either the PSQI or OSA-MA, depending on the study. The specific demographics and characteristics of each RCT selected can be found in Table 1.

The author of this systematic review utilized CINAHL Plus and Alt HealthWatch to select the studies and all articles used were published in peer-reviewed journals in the English language from 2010 to 2015. Keywords used to search this database included "insomnia, lavender oil and aromatherapy." Articles were selected based on whether they helped to answer the clinical question and if they were patient oriented evidence that matters (POEM). The statistics analyzed and utilized for this review were mean change from baseline, P-values,

ANOVA F-scores, relative risk reduction (RRR), absolute risk reduction (ARR), and numbers needed to treat (NNT).

Table 1: Demographics of the Included Studies

| Study | Type | #Pts | Age | Inclusion Criteria | Exclusion Criteria | W/D | Interventions |
|------------------------------------|------------------------------|------|---------|--|---|-----|--|
| Hirokawa⁷ (2012) | Single blind RCT | 18 | Avg. 19 | •None mentioned | •None mentioned | 3 | Inhalation of lavender oil via open bottle containing 5x5 cm of gauze soaked in lavender oil |
| Kasper⁸ (2010) | Double blind RCT (two stage) | 216 | 18-65 | <ul style="list-style-type: none"> •18-65 y/o •Non-pregnant women •Men or women with dx anxiety disorder •Hamilton Anxiety (HAMA) Scale score ≥ 18 AND Pittsburgh Sleep Quality index >5 | <ul style="list-style-type: none"> •HAMA total score decrease $\geq 25\%$ during the first stage •Anyone with psychiatric/neurological dx other than anxiety disorder •Risk of suicide or substance abuse disorder. •Pregnancy | 29 | 80mg capsule of Silexan (lavender oil preparation) qd x 10 weeks |
| Lillehei⁹ (2015) | Double blind RCT | 79 | 18-36 | <ul style="list-style-type: none"> •English speaking college student •≥ 18 •Self - reported sleep issues | <ul style="list-style-type: none"> •Pregnancy •Night shift work •Use of prescription sleep medications | 7 | Inhalation of lavender oil via 3cm adhesive patch with 1cm disc of absorbent material that contained 55ul of lavender oil) |

OUTCOMES MEASURED

This review utilized three RCTs and the outcome measured was patient reported improvement in overall sleep quality. This was accomplished by two of the studies using PSQI and the other using OSA-MA. The results were measured using a sleep quality questionnaire

post-intervention compared to the patient's baseline self-reported score. The results were then compared to the control group

Sleep quality was defined based on components that make up the PSQI as well as the OSA-MA. The PSQI measures subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction.⁶ While the OSA-MA takes into consideration slightly different components of sleep quality: sleepiness at awakening, difficulty in falling asleep and maintaining sleep, dreams, daytime tiredness and duration of sleep.⁷

RESULTS

Hirokawa et al. compared seven Japanese students who received lavender aromatherapy to eight students who received a visually matched placebo in a single blind RCT.⁷ The study took place over a total of 11 days, with the first three days being pre-intervention, five days of the intervention, and three days for post-intervention analysis.⁷ During the five night intervention period, participants were instructed to open a bottle before going to sleep that contained a gauze patch soaked in lavender oil.⁷ Participant's sleep quality was assessed by the OSA-MA, along with the participants reporting the estimated duration of their sleep.⁷ Table 2 shows the components of OSA-MA that were assessed, as well as the statistics reported in the study. Overall, this study only showed statistically significant improvement in one element of OSA-MA, which was improved sleepiness at awakening.⁷

Kasper et al. performed a double-blind two-stage RCT in Germany on a total of 216 participants, with 75% being female.⁸ The experimental group consisted of 107 participants who were given an orally administered preparation of lavender oil, called Silexan, daily for ten weeks.⁸ Assessments were performed at two-week intervals.⁸ At the conclusion of the study,

participants who did not finish the study were accounted for, but not analyzed. All calculations performed used a total number of 104 and 108 participants for the experimental and control group, respectively.⁸ Participants were considered responders to the Silexan treatment if they showed a greater than or equal to 50% decrease in total PSQI score from baseline compared to post-intervention at week 10.⁸ A total of 76.9% of participants treated with Silexan did show sleep quality improvement.⁸ Dichotomous data was collected and the results are in Table 3. This study showed statistical improvement in overall sleep quality with the use of lavender, with a RRR of 56.6%, ARR of 27.8% and 4 as the NNT.

Table 2. Hirokawa et al. Post-Intervention Statistics

| Variables | Mean change from baseline | ANOVA F score | P-value |
|---|----------------------------------|----------------------|----------------|
| Improved sleepiness at awakening | 17.2 | 7.8 | <.01 |
| Improved difficulty falling asleep | 21.6 | 2.9 | <.10 |
| Better dreams | 19.4 | 0.8 | .47 |
| Alleviation of tiredness | 17.8 | 1.8 | .21 |
| Longer duration of sleep | 17.3 | 0.3 | .76 |
| Sleep hours | 6.5 | 0.1 | .93 |

Table 3: Kasper et al. baseline to post-intervention comparison

| Silexan (Mean ± SD) | Placebo (Mean ± SD) | Confidence Interval | P value |
|----------------------------|----------------------------|----------------------------|----------------|
| 5.5 ± 4.4 | 3.8 ± 4.1 | 0.6-2.9 | 0.002 |

Lillehei et al. conducted a double-blind RCT on college students, with 39 participants randomized into the experimental group to receive a lavender patch and 40 participants randomized into the control group, receiving a blank patch.⁹ The authors reported most participants were white, that two-thirds of participants were female, and the mean age of participants was 21.6.⁹ Race was the only statistically significant difference amongst the two groups.⁹ This study took place over five nights with participants being instructed to wear a patch on their mid-upper chest while they slept.⁹ Baseline, post-intervention and two-week follow-up

assessments were done via each participant completing the PSQI.⁹ At the conclusion of this study, participants who discontinued the intervention (three total) or who were lost to follow-up (four total) were accounted for but not analyzed.⁹ Lillehei et al. provided a mean change from baseline to post-intervention of 3.2 for the experimental group and zero for the control group.⁹ Statistically significant improvement in overall sleep quality was demonstrated in the experimental group when compared to the control group at both post-intervention and at two-week follow-up, further details are listed in Table 4.

Table 4: Lillehei et al. P-value analysis

| Variable | Post-Intervention P-value | Two-Week Follow-Up P-value |
|---------------------------|----------------------------------|-----------------------------------|
| Experimental Group | 0.01 | <0.001 |
| Control Group | 0.02 | 0.06 |

DICUSSION

The purpose of this systematic review was to collect data that focused on whether or not lavender oil is an effective therapy in improving sleep quality in adults ages 18 to 65. All three studies did show a benefit in sleep quality with the use of lavender oil, with Kasper et al. reporting adverse events in 36.4% of participants in their experimental group, dyspepsia being the most common, and Lillehei et al. reporting minor skin irritation in four participants.^{7,9} Each study used in this systematic review had similar limitations, including whether all participants were compliant to the instructions given, as well as the variation in numbers of hours slept, caffeine and stimulus use and life stressors amongst each participant. The mode of intervention varied amongst these studies which may impact results. Hirokawa et al. and Lillehei et al. used an inhalation technique via Hirokawa et al. using a gauze patch soaked in lavender oil placed in a bottle and Lillehei et al. using an adhesive patch on the mid-upper chest.^{7,9} Whereas Kasper et al. studied lavender oil effects in a pill form that was ingested daily by participants.⁸

Kasper et al. gave the control group a different pill that contained 0.08mg of lavender compared to the 80mg of the experimental group in order to allow for each pill to smell the same.⁸ Even this small addition of lavender to the control group's pill could have skewed results. Thirty-seven percent of participants in Lillehei et al. study reported their lavender patch fell off while sleeping.⁹ Hirokawa et al. told their subjects prior to invention that an aromatherapy would be given and that it is presumed that the aromatherapy will have sleep improving sedative effects.⁷ This information could have created an expectation as well as potential bias. Hirokawa et al. used an extremely small sample size, with only Japanese participants and did not have equal numbers of men compared to women.⁷ Lillehei et al. study did have a statistically significant difference in race between groups.⁹ It is possible that gender and ethnicity could play a role in how one responds to lavender oil.

CONCLUSION

The findings of all three studies show a correlation in improved sleep quality with both the inhalation and ingestion of lavender oil. It does remain uncertain as to whether continued long-term use of inhalation or ingestion of lavender oil has detrimental side-effects. Further research is needed to be performed in order to determine this. It would also be beneficial to analyze participants with diagnosed sleep disorders treated with lavender oil compared to participants treated with a commonly used medications to determine which is more efficient in improving overall sleep quality.

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